



# M.Sc. MATHEMATICS

## PROGRAMME SPECIFIC OUTCOME

- PSO1:** Acquire knowledge in the fundamental axioms in mathematics and capability of developing ideas based on them
- PSO2:** Nurture problem-solving skills in pure and applied mathematics
- PSO3:** Develop abstract mathematical thinking and reasoning through advanced knowledge on topics in pure mathematics.
- PSO4:** Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains
- PSO5:** Prepare students for research studies in mathematics and related fields.

# COURSE OUTCOME

## SJMTH1C01 : ALGEBRA1

SJMTH1C01.1	Understand plane isometries, direct products and solve problems related
SJMTH1C01.2	Understand the concepts of fundamental theorem of Abelian groups and classify all finitely generated abelian groups upto isomorphism
SJMTH1C01.3	Understand the concepts of isomorphism theorems, Sylow theorems, free groups and work out problems related to it
SJMTH1C01.4	Understand the the concepts of rings of polynomial, group presentations and other theories related to it

## SJMTH1C02 : LINEAR ALGEBRA

SJMTH1C02.1	Understand definition and properties of Vector spaces with examples
SJMTH1C02.2	Realize the applications and role of linear transformations in different areas
SJMTH1C02.3	Understand elementary canonical forms and its applications
SJMTH1C02.4	Understand inner product space and its properties with illustrations

## SJMTH1C03 : REAL ANALYSIS I

SJMTH1C03.1	Understand the continuity of functions
SJMTH1C03.2	Compare convergence and uniform convergence
SJMTH1C03.3	Explain how uniform convergence affects the differentiation and integration
SJMTH1C03.4	Explain Riemann Stieltjes integral and it"s properties.
SJMTH1C03.5	Describe equicontinuous families of functions

## SJMTH1C04 : DISCRETE MATHEMATICS

SJMTH1C04.1	Understand the concepts of order relations, Boolean Algebra and Boolean Functions
SJMTH1C04.2	Get an idea about graphs, subgraphs , Automorphisms and operations on graphs
SJMTH1C04.3	Determine degree of vertices, connectivity
SJMTH1C04.4	Understand the concepts of planarity and dual of graphs
SJMTH1C04.5	Design DFA and NFA of languages and conversion from NFA to DFA

## SJMTH1C05 : NUMBER THEORY

SJMTH1C05.1	Understand concepts of arithmetical functions and Dirichlet Multiplication.
SJMTH1C05.2	Learn some elementary theorems on the distribution of prime numbers, Quadratic residues and reciprocity law
SJMTH1C05.3	Encrypt and decrypt secret keys using cryptography

## SJMTH2C06 : ALGEBRA II

SJMTH2C06.1	Understand the concepts and properties of prime and maximal ideals
SJMTH2C06.2	Understand theory and concepts of Extension field
SJMTH2C06.3	Understand finite fields and its applications
SJMTH2C06.4	Distinguish Algebraic extension, separable extension, cyclotomic extensions and its properties
SJMTH2C06.5	Understand Galois theory through illustrations and its application

## SJMTH2C07 : REAL ANALYSIS II

SJMTH2C07.1	Describe Lebesgue Measure
SJMTH2C07.2	Illustrate Lebesgue Measurable functions
SJMTH2C07.3	Importance of Lebesgue integral over Riemann integral
SJMTH2C07.4	Description of completeness and approximation
SJMTH2C07.5	Understand $L_p$ spaces

## SJMTH2C08 : TOPOLOGY

SJMTH2C08.1	Understand the concepts of topological spaces and its properties
SJMTH2C08.2	Understand concepts of Quotient space and its special properties
SJMTH2C08.3	Understand the theory of separation axioms and characterization of normality

## SJMTH2C09 : ODE AND CALCULUS OF VARIATIONS

SJMTH2C09.1	Understand the concept of power series solutions
SJMTH2C09.2	Learn about special functions of mathematical physics
SJMTH2C09.3	Learn to solve systems of first order equations
SJMTH2C09.4	Understand the concept of non linear equations
SJMTH2C09.5	Learn about oscillation theory and boundary value problems
SJMTH2C09.6	Understand existence and uniqueness theorem

## SJMTH2C10 : OPERATIONS RESEARCH

SJMTH2C10.1	Understand Convex Functions
SJMTH2C10.2	Model Optimization problem to optimize real life objectives
SJMTH2C10.3	Understand the optimal outcome and what the tradeoffs are to achieve that outcome using Game Theory
SJMTH2C10.4	Develop good algorithm for solving Network Flow

## SJMTH3C11 : MULTIVARIABLE CALCULUS AND GEOMETRY

SJMTH3C11.1	Develop the concept functions of several variable, Linear Transformations and its properties
SJMTH3C11.2	Understand Implicit function theorem and inverse function theorem and its application
SJMTH3C11.3	Understand about concept of curves and its special cases, reparametrization, curvature, Surface, tangents and normals
SJMTH3C11.4	Identify level surfaces and its applications
SJMTH3C11.5	Understand concepts of Gauss and weingarten map, curvatures

## SJMTH3C12 : COMPLEX ANALYSIS

SJMTH3C12.1	Understand the extended plane and its spherical representation, power series and analytic functions.
SJMTH3C12.2	Understand Mobius transformations and Riemann Stieltjes integrals.
SJMTH3C12.3	Understand ideas of zeros of analytic functions , power series representation of analytic functions and the index of a closed curve
SJMTH3C12.4	Understand Cauchy's theorem and integral formula , the homotopic version of Cauchy's theorem and simple connectivity
SJMTH3C12.5	Understand concepts of singularities, residues, the argument principle, maximum principle, Schwarz lemma and Hadamard's Three Circles Theorem

## SJMTH3C13 : FUNCTIONAL ANALYSIS

SJMTH3C13.1	Understand basic properties of metric spaces
SJMTH3C13.2	Understand basic properties of Hilbert spaces
SJMTH3C13.3	Explain theorems on Bounded linear functionals
SJMTH3C13.4	Apply Hahn Banach theorems on dual spaces
SJMTH3C13.5	Identify properties of Bounded linear operators, compact operators, finite ranked operators, integral operators and invertible operators

## SJMTH3C14 : PDE AND INTEGRAL EQUATIONS

SJMTH3C14.1	Formulate and identify PDE
SJMTH3C14.2	Understand concepts and techniques of solving PDE
SJMTH3C14.3	Analyze different types of boundary value problems
SJMTH3C14.4	Understand concepts and techniques of solving Integral equations

## SJMTH3E03 : MEASURE AND INTEGRATION

SJMTH3E03.1	Understand the concept of measurability, simple functions and elementary properties of measures, Riesz representation theorem
SJMTH3E03.2	Learn the concept of regularity properties of Borel measure
SJMTH3E03.3	Learn the concept of Lebesgue measure, continuity properties of measurable functions and total variations
SJMTH3E03.4	Understand about bounded linear functions on $L^p$ spaces
SJMTH3E03.5	Understand Fubini theorem

## SJMTH4C15 : ADVANCED FUNCTIONAL ANALYSIS

SJMTH4C15.1	Understand the concepts of spectrum and its classification, Fredholm theory of compact operators, self adjoint operators, compact operators and its properties
SJMTH4C15.2	Understand minimax principle and applications to integral operators
SJMTH4C15.3	Understand the concept of order in the space of self adjoint operators, properties of ordering, projection operators and orthoprojectors
SJMTH4C15.4	Understand the construction of the spectral integral and Hilbert theorem
SJMTH4C15.5	Understand the Banach open mapping theorem, the closed graph theorem, the Banach Steinhaus theorem and Gelfand's theorem on maximal ideals

## SJMTH4E06 : ALGEBRAIC NUMBER THEORY

SJMTH4E06.1	Understand the concepts of symmetric polynomials, modules, free abelian groups, Algebraic numbers, conjugates and discriminants, algebraic integers, integral bases, norms and traces
SJMTH4E06.2	Learn about rings of integers, quadratic fields and cyclotomic fields
SJMTH4E06.3	Understand the concept of factorization in to Irreducibles and prime factorization
SJMTH4E06.4	Get an idea about Euclidean domains, Euclidean quadratic fields ideals, prime factorization of ideals and normal of an ideal
SJMTH4E06.5	Learn about lattices, quotient torus, Minkowski theorem, class group, Numbers lemma and theorem

## SJMTH4E09 : DIFFERENTIAL GEOMETRY

SJMTH4E09.1	Understand about graphs, level set, vector fields
SJMTH4E09.2	Realize role and properties of Tangent space, Orientation and its importance
SJMTH4E09.3	Understand geodesics, Weingarten map and its properties
SJMTH4E09.4	Understand curvatures and parametrization of plane curves and surfaces

## SJMTH4E11 : GRAPH THEORY

SJMTH4E11.1	Understand the fruitful construction of network
SJMTH4E11.2	Differentiate various graphs
SJMTH4E11.3	Realize the connection of practical situation and theorems in graph theory
SJMTH4E11.4	Develop new theory
SJMTH4E11.5	Understand to apply the theory to real life

## SJMTH4P01 : PROJECT

SJMTH4P01.1	Understand high level mathematics ideas
SJMTH4P01.2	Analyze the concept with application
SJMTH4P01.3	Develop fresearch aptitude

## SJMTH4V01 : VIVA VOCE

SJMTH4V01.1	Demonstrate knowledge in the subject domain
SJMTH4V01.2	Communicate ideas clearly and precisely
SJMTH4V01.3	develop deep understang of basic concepts and application